Advances in Social Science and Culture
ISSN 2640-9682 (Print) ISSN 2640-9674 (Online)
Vol. 8, No. 1, 2026
www.scholink.org/ojs/index.php/assc

Original Paper

An Empirical Study on the Coupling Development of the Red Tangerine Industry and Rural Tourism in the Three Gorges Reservoir Area

Huiyue Tan[1]

[1] Chongqing Normal University, Chongqing, China

Received: October 19, 2025 Accepted: December 26, 2025 Online Published: January 07, 2026

doi:10.22158/assc.v8n1p11 URL: http://dx.doi.org/10.22158/assc.v8n1p11

Abstract

Against the dual background of the rural revitalization strategy and ecological protection in the Three Gorges Reservoir Area, the coupling development of the red tangerine industry and rural tourism in Wanzhou District is a key path to addressing industrial predicaments and tourism shortcomings. However, existing studies lack adaptability analysis for the special scenarios of the reservoir area. Based on time-series data and cross-sectional data from 2015 to 2024, this study constructs an evaluation system incorporating characteristic indicators such as ecological carrying capacity and immigrant employment driving rate, and systematically measures the coupling level using methods including the entropy weight method and coupling coordination degree model. The results show that the coupling degree increased from 0.40 to 0.73, realizing the leap from the antagonism stage to the running-in stage; the coupling coordination degree rose from 0.34 to 0.67, completing the upgrade from mild imbalance to good coordination; the relative development degree evolved from "rural tourism lagging → basically synchronized → red tangerine industry lagging", with an E value of 0.89 in 2024, indicating that the lag in the tourism-oriented transformation of the industry is the core contradiction. Weak infrastructure and loose interest linkage are the main restrictive factors. The four-dimensional optimization path proposed in the study can provide reference for industrial integration in the reservoir area.

Keywords

Red tangerine industry, Rural tourism, Coupling coordination, Three Gorges Reservoir Area

Under the policy orientation of advancing the rural revitalization strategy in depth, deepening the coupling development of characteristic agriculture and rural tourism has become a core path to solving

the “three rural issues” and realizing industrial integration and upgrading. The “Comprehensive Rural Revitalization Plan (2024-2027)” clearly proposes to focus on advantageous areas of characteristic agricultural products and explore the integration path of modern agriculture and leisure tourism, providing policy support for the coupling development of agriculture and tourism. As the core hinterland of the Three Gorges Reservoir Area, Wanzhou District of Chongqing shoulders the dual mission of ecological barrier protection in the upper reaches of the Yangtze River and high-quality regional economic development. The coordinated advancement of the transformation of its characteristic industries and the development of tourism resources has typical demonstration significance for rural revitalization in the reservoir area.

From the perspective of regional development reality, Wanzhou red tangerine, as a candidate resource for important agricultural cultural heritage in China with a 4,000-year planting history, has a foundation of large-scale planting and unique cultural value, but faces dilemmas such as declining planting area, short industrial chain, and increasing production without increasing income. Meanwhile, local rural tourism is dominated by shallow sightseeing, with shortcomings such as homogeneous formats, significant seasonal dependence, and insufficient cultural empowerment. The two have not yet formed a benign interaction pattern of in-depth coupling, which not only restricts the value improvement of the red tangerine industry but also limits the differentiated development of rural tourism.

A review of existing studies reveals three obvious gaps in the field of agriculture-tourism coupling: first, research areas focus on the plain areas in the eastern and central regions, and studies on the coupling of characteristic agriculture and rural tourism under the ecological constraints and immigrant cultural background of the Three Gorges Reservoir Area are relatively weak, making it difficult for mature experiences in the eastern and central regions to be directly adapted to the special scenarios of the reservoir area; second, the evaluation system lacks regionally characteristic indicators, as existing indicators are mostly designed around general dimensions such as industrial scale and tourism reception, without fully incorporating core concerns of the reservoir area such as ecological carrying capacity and immigrant employment drive, leading to a disconnect between evaluation results and regional actual needs; third, the coupling mechanism of a single agricultural product is not clearly analyzed. Most existing studies take large-scale agricultural industries as objects, and a systematic analysis framework has not been formed for the whole-chain coupling logic of “planting-processing-culture-tourism” for single agricultural products with cultural heritage attributes such as red tangerines.

Based on this, this study takes the red tangerine industry and rural tourism in Wanzhou District as the research objects, with three core objectives: first, to construct a coupling evaluation index system adapted to the characteristics of the Three Gorges Reservoir Area, focusing on supplementing ecological, immigrant, and cultural characteristic indicators to improve the regional adaptability of the evaluation; second, to use quantitative methods to measure the coupling development level and

time-series evolution characteristics of the two from 2015 to 2024, and clarify the current coupling stage and core contradictions; third, to propose targeted optimization paths based on empirical results.

To clearly present the coupling development characteristics of the red tangerine industry and rural tourism in Wanzhou District, this part analyzes from three dimensions: the evolution of coupling stages, the dynamics of relative development, and the impact of restrictive factors, combined with data visualization and logical decomposition, to clarify the core laws and key contradictions of their coupling, based on time-series data from 2015 to 2024.

1. Empirical Results

1.1 Time-Series Evolution of Coupling Degree and Coupling Coordination Degree

From 2015 to 2024, both the coupling degree (C) and coupling coordination degree (D) of the red tangerine industry and rural tourism in Wanzhou District showed a steady upward trend, realizing a leap from low-level interaction to high-quality coordination. The specific time-series changes are shown in Figure 6-1.

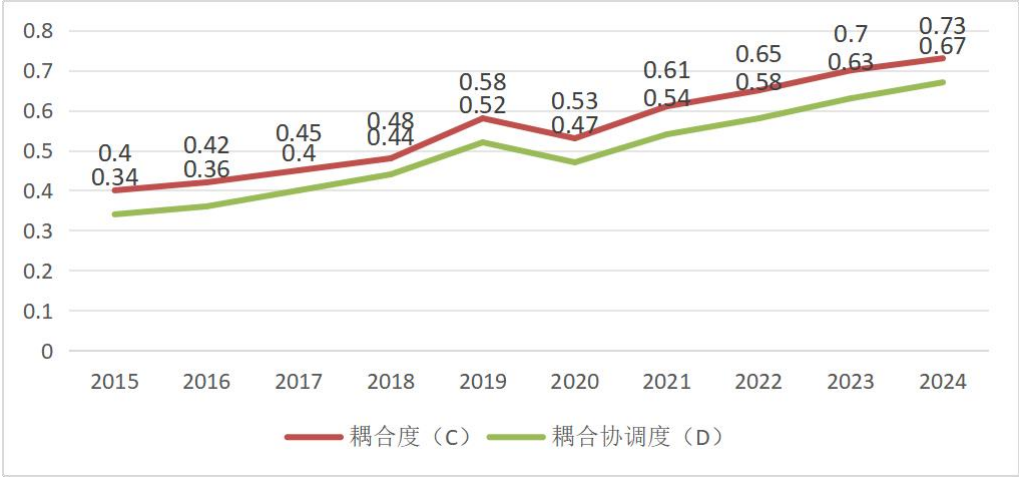

Figure 1. Trends in the Coupling Degree and Coupling Coordination Degree of the Red Tangerine Industry and Rural Tourism in Wanzhou District from 2015 to 2024

Data sources: Wanzhou District Statistical Yearbook 2015-2024, Field Survey Data 2024.

1.2 Dynamic Evolution of Relative Development Degree

The time-series change of the relative development degree (E) reflects the difference in development speed between the red tangerine industry (U_1) and rural tourism (U_2), showing three stages: "rural tourism lagging → basically synchronized → red tangerine industry lagging". The specific data are shown in Table 1.

Table 1 Evolution of the Relative Development Degree of the Red Tangerine Industry and Rural Tourism in Wanzhou District from 2015 to 2024

Year	U_1	U_2	E	Relative Development Type
2015	0.29	0.27	1.07	Rural tourism lagging type
2016	0.32	0.30	1.07	Rural tourism lagging type
2017	0.36	0.35	1.03	Rural tourism lagging type
2018	0.41	0.40	1.03	Rural tourism lagging type
2019	0.48	0.47	1.02	Basically synchronized type
2020	0.45	0.38	1.18	Rural tourism lagging type
2021	0.51	0.43	1.19	Rural tourism lagging type
2022	0.54	0.51	1.06	Basically synchronized type
2023	0.56	0.58	0.97	Red tangerine industry lagging type
2024	0.58	0.65	0.89	Red tangerine industry lagging type

Data source: Subsystem comprehensive index calculated based on the entropy weight method, 2015-2024.

1.3 Contribution Rate of Core Restrictive Factors

Using the grey relational analysis method, the influence intensity of 4 types of core restrictive factors on the coupling coordination degree (D) was quantified. The results are shown in Table 2. Among them, weak infrastructure has the most significant restriction on the coupling quality, while insufficient brand influence has a relatively small impact.

Table 2. Contribution Rate of Core Restrictive Factors for the Coupling of the Red Tangerine Industry and Rural Tourism in Wanzhou District

Core Restrictive Factors	Corresponding Indicators	Indicator Relational Degree ri	Average Relational Degree	Contribution Rate	Contribution Rate Ranking
A. Lack of linkage between deep processing and tourism	Types of red tangerine deep-processed products	0.782	0.756	27.80%	3
	Tourism added value of the red tangerine industry	0.730			
B. Weak infrastructure	Density of tourism highways in tangerine-growing areas	0.895	0.858	35.20%	1
	Qualified rate of tourist toilets in tangerine-growing areas	0.821			

C. Weak benefit coordination	Proportion of tourism-related income of tangerine farmers	0.812	0.785	28.10%	2
	Immigrant employment driving rate	0.758			
D. Insufficient brand influence	Proportion of red tangerine-themed tourism income	0.703	0.696	25.60%	4
	Number of red tangerine culture promotion activities	0.689			

Data source: Grey relational analysis results, 2015-2024.

2. Result Analysis

2.1 Coupling Stage Leap: From Antagonism and Imbalance to Running-in and Coordination

From 2015 to 2024, the coupling development of the two achieved a double leap, with the core driving force shifting from spontaneous exploration to policy coordination.

First Stage: Antagonism Stage and Imbalance Stage (2015-2018)

During this stage, the coupling degree remained stable between 0.40 and 0.48, in the antagonism stage, and the system interaction showed a weak correlation characteristic of “one-way supply from the red tangerine industry and passive acceptance by rural tourism”. From the industrial side, the red tangerine industry already had basic supporting capacity but lacked tourism-oriented transformation; from the tourism side, rural tourism could not fully undertake industrial resources due to insufficient facilities

and single formats, resulting in the coupling coordination degree being lower than 0.5 for a long time, in the low-level range of mild imbalance and barely coordinated.

Second Stage: Running-in Stage and Coordination Upgrade Stage (2019-2024)

2019 became a key turning point. With the launch of the "Three Gorges Tangerine Township" rural revitalization demonstration belt (the government invested 230 million yuan to improve infrastructure), the coupling degree jumped from 0.48 in 2018 to 0.58, breaking through the running-in stage threshold for the first time. In 2020, affected by the epidemic, the comprehensive rural tourism index (U_2) dropped to 0.38, and the coupling degree temporarily fell back to 0.53, but still remained in the running-in stage, highlighting the risk resistance resilience of the red tangerine industry. From 2021 to 2024, with the upgrading of the Red Tangerine Cultural Tourism Festival and the construction of transparent workshops, the coupling degree continued to rise to 0.73, and the system interaction shifted from one-way adaptation to two-way coordination.

During the same period, the coupling coordination degree was upgraded synchronously: it was in the barely coordinated stage from 2019 to 2022, mainly because the comprehensive development level (T) increased from 0.40 to 0.52, and the tourism added value of the red tangerine industry increased from 185 yuan/mu to 600 yuan/mu; it entered the good coordination stage from 2023 to 2024, marking the shift from low-quality coordination to high-quality coordination between the two. In 2024, the proportion of red tangerine-themed tourism income reached 22.6%, and the immigrant employment driving rate was 38.2%, with significant improvement in comprehensive benefits.

2.2 Relative Development Dynamics: Contradiction Transformation from Tourism Lagging to Industry Lagging

The evolution of the relative development degree (E) clearly reflects the adaptation contradiction between the two systems, with the core contradiction shifting from insufficient tourism undertaking capacity to weak industrial supply adaptability.

First Stage: Rural Tourism Lagging (2015-2018)

During this stage, the E value remained between 1.03 and 1.07, with contradictions focusing on the dual shortcomings of rural tourism facilities and formats. On the one hand, infrastructure coverage was insufficient. In 2018, the qualified rate of tourist toilets in remote tangerine-growing areas was only 55%, and the parking lot gap reached 30%, leading to a tourist loss rate of 12%; on the other hand, the depth of formats was insufficient. Among the 8 red tangerine picking bases, only 1 provided simple processing experiences, and formats such as cultural research and folk activities were completely absent, making it impossible to undertake the cultural and experiential resources of the red tangerine industry and restricting the depth of coupling.

Second Stage: Basically Synchronized (2019-2022)

In 2019, the E value dropped to 1.02, entering the basically synchronized type. The key lies in the two-way shortage supplementation driven by policies: the industrial side improved supply capacity through the construction of large-scale bases, and the tourism side strengthened undertaking capacity

through the opening of tourism special lines and toilet renovation, making the growth rates of the two systems approach. The E value rebounded temporarily to 1.18-1.19 in 2020-2021, which was a temporary imbalance under the impact of the epidemic, and returned to synchronization with the recovery of the tourism market in 2022.

Third Stage: Red Tangerine Industry Lagging (2023-2024)

In 2023, the E value dropped below 0.97 for the first time, and further fell to 0.89 in 2024, with the contradiction completely shifting to the red tangerine industry. In terms of growth rate, the average annual growth rate of the comprehensive rural tourism index (U_2) was 5.7% from 2021 to 2024, significantly higher than that of the red tangerine industry (U_1) of 3.2%. Rural tourism's demand for "deep processing experience" and "cultural immersion" grew rapidly; however, the industrial side was insufficiently adaptive. In 2024, there were only 8 types of red tangerine deep-processed products, including 2 types of experiential products, and the number of red tangerine culture promotion activities decreased by 20% compared with 2019, failing to meet the upgrading of tourism demand, resulting in a new contradiction where tourism is ahead and the industry cannot keep up.

2.3 Logic of Restrictive Factors: Infrastructure as the Foundation, Benefit Coordination as the Vein, and Deep Processing Linkage as the Core

From the ranking of contribution rates in Table 2, the impact of the four types of restrictive factors presents a hierarchical progressive logic: infrastructure is the basic guarantee, benefit coordination is the driving support, and deep processing linkage is the value core.

Weak Infrastructure: The "Hardware Bottleneck" of Coupling Development

Weak infrastructure became the primary constraint with a contribution rate of 35.20%, and the core problems are spatial imbalance and functional mismatch. In terms of space, the density of tourism highways in core producing areas such as Dazhou Town and Xintian Town reached 0.8km/100km² in 2024, while that in remote producing areas such as Changtan Town and Baiyang Town was only 0.45km/100km². The difference in highway density led to the tourist reception volume of remote producing areas being only 1/3 of that of core producing areas; in terms of function, 45% of tourist toilets in remote producing areas were still unqualified in 2024, and 30% of picking bases had no parking lots, directly affecting tourist experience and customer retention, and becoming a hard obstacle to expanding the scope of coupling.

Weak Benefit Coordination: The "Power Shortcoming" of Coupling Sustainability

The core of weak benefit coordination is uneven interest distribution, leading to insufficient enthusiasm of tangerine farmers to participate. A 2024 survey showed that in red tangerine-themed tourism projects, tourism enterprises obtained 70% of the benefits, while tangerine farmers only obtained 30%, and the proportion of tourism-related income of tangerine farmers in their total household income was only 18%, significantly lower than the average level of 30% of similar projects in the eastern and central regions. Loose interest linkage made tangerine farmers lack motivation to upgrade planting

technologies, which in turn dragged down the supporting capacity of the red tangerine industry for tourism.

Lack of Linkage between Deep Processing and Tourism: The "Value Gap" of Coupling Value-added

The lack of linkage between deep processing and tourism directly restricts the improvement of coupling added value. In 2024, the deep processing rate of red tangerines in Wanzhou District was only 45%, and among the 32 processing enterprises, only 2 opened "transparent workshops". Tourists could not participate in in-depth experiences such as orange sauce boiling and orange essential oil extraction, resulting in a tourism stay time of only 2-3 hours (compared with 4-6 hours for similar projects in the eastern and central regions), and the tourism added value of the red tangerine industry was 780 yuan/mu, 35% lower than that of Nanfeng mandarins in Jiangxi. Insufficient experience supply not only limits the growth of tourism income but also makes the red tangerine industry miss the value-added opportunities of processing and tourism, becoming a key bottleneck for the coupling quality to break through to a high level.

In summary, the red tangerine industry and rural tourism in Wanzhou District have achieved a double leap in coupling stages and coordination levels. However, it is currently necessary to focus on resolving the core contradiction of the lagging red tangerine industry, prioritize addressing the shortcomings of infrastructure, strengthen benefit coordination, and promote the linkage between deep processing and tourism, so as to push the coupling relationship towards high-level coupling and high-quality coordination.

References

Chen, J. J., & Li, N. (2021). Research on the Integration of the Whole Value Chain of Red Tangerine Industry in "Production-Processing-Circulation-Service". *Journal of Agrotechnical Economics*, *2021*(03), 112-121. (Special research literature on red tangerine industry, supporting the analysis of industrial chain extension)

Chen, Y., & Li, M. (2021). Benefit Evaluation of Migrants' Participation in Rural Tourism in the Three Gorges Reservoir Area. *Resources and Environment in the Yangtze Basin*, *30*(08), 1920-1928. (Key literature on migrant employment research in the reservoir area, supporting the design of migrant employment driving rate indicators)

Huang, L., & Chen, Y. (2023). Study on the Path of Characteristic Agricultural Products Driving Rural Tourism in the Yangtze River Delta. *Economic Geography*, *43*(01), 221-228. (Comparative literature on agricultural-tourism coupling in the eastern and central regions, highlighting the differentiation of paths in the reservoir area)

Li, H., & Wang, M. (2021). Coupling Evaluation of Agricultural Products and Rural Tourism in Agricultural Cultural Heritage Areas—A Case Study of Hani Rice Cultivation System in Yunnan Province. *Chinese Journal of Agricultural Resources and Regional Planning*, *42*(09), 214-222.

(Literature on agricultural-tourism coupling evaluation methods in agricultural cultural heritage areas, adapting to the heritage attribute of red tangerines)

Li, W. W., & Wang, H. M. (2006). Industrial Integration and Tourism of Shanghai World Expo. *Shanghai Economic Research*, *2006*(08), 48-54. (Core literature on industrial integration theory, laying the theoretical foundation for the coupling of agriculture and tourism)

Lin, L. (2023). Study on the Integrated Development of Red Tangerine Industry and Cultural Tourism. *Tourism Tribune*, *38*(07), 103-113. (Literature on cultural empowerment of tourism by red tangerine industry, strengthening the design of cultural inheritance indicators)

Liu, Y. S., & Long, H. L. (2011). Progress and Prospect of Agricultural Geography and Rural Development Research in China. *Progress in Geography*, *30*(04), 409-416. (Key literature on the application of agricultural multifunction theory, supporting the analysis of the diversified transformation of industrial value)

Liu, Y., & Chen, M. (2024). Mechanism and Path of Digital Economy Empowering Agricultural-Tourism Integration—An Empirical Study Based on 120 Characteristic Agricultural Product Producing Areas in China. *Chinese Rural Economy*, *2024*(02), 45-62. (Recent literature on digital agricultural-tourism research, supplementing the research limitations and future prospects)

Wang, A. M., & Zhao, Q. (2022). Study on the Development of Citrus Industry Based on Value Chain Model—Taking Red Tangerine as an Example. *Journal of China Agricultural University*, *27*(06), 181-190. (Literature on citrus industry value chain analysis, supporting the logic of whole-chain coupling)

Wang, X. C., & Li, X. S. (2015). Construction of Evaluation Index System for the Coupling Development of Characteristic Agricultural Products and Rural Tourism. *Research of Agricultural Modernization*, *36*(03), 473-478. (Basic literature on agricultural-tourism coupling evaluation system, providing logic for index selection)

Zhang, H., & Fang, X. H. (2019). Mechanism and Path of Geographical Indication Agricultural Products Driving Rural Tourism Development—A Case Study of Qixia Apple in Shandong Province. *Issues in Agricultural Economy*, *2019*(07), 131-139. (Classic case of agricultural-tourism coupling mechanism research, providing reference for index design)

Zhang, J., & Zhang, Y. (2020). Calculation and Analysis of Coupling Coordination Degree between Ecological Agriculture and Ecotourism Based on Grey System Theory—A Case Study of Hunan Province. *Ecological Economy*, *36*(02), 68-73. (Literature on the application of grey correlation method, supporting the calculation of contribution rate of restrictive factors)

Zhang, W., Liu, J., & Wang, L. (2023). Study on the Whole-Chain Agricultural-Tourism Integration Model of Characteristic Agricultural Products—A Case Study of Nanfeng Tangerine in Jiangxi Province. *Tourism Tribune*, *38*(03), 67-78. (Practical case of citrus-based agricultural-tourism coupling, providing reference for the path of deep processing and experiential development)

Zhao, L., & Li, J. (2022). Study on the Coupling Mechanism of Agricultural Products and Rural Tourism in the Three Gorges Reservoir Area under Ecological Constraints. *Journal of Southwest University (Natural Science Edition)*, *44*(05), 1-9. (Core literature on special research in the reservoir area, clarifying the design basis of ecological carrying capacity indicators)

Zheng, X. M. (2022). Research on the Protection of Red Tangerine Cultural Heritage and Rural Revitalization. *Journal of China Agricultural University (Social Sciences Edition)*, *39*(02), 96-104. (Literature on the cultural heritage attribute of red tangerines, improving the analysis of cultural inheritance dimension)